Docket No.: 0365-0685PUS1
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Timo HEINO et al.

Application No.: 10/591,436 Confirmation No.: 1746

Filed: September 1, 2006 Art Unit: 1797

For: METHOD AND APPARATUS FOR PRODUCING POLYMERS Examiner: N. E. Young

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Timo Heino, do declare and state as follows:

1. I am one of the inventors of the above-identified application. I am a technician graduated from a technical institute in 1975 after which I have worked as a supervisor in both operation and maintenance in petrochemical and polyolefin plants in Porvoo. My work history includes working in operation, process development, maintenance of the polymerization plants and construction and start-up projects of polymerization plants.

2. I have reviewed the above-identified application, as well as the USPTO Office Action dated May 4, 2009 which issued in connection with the above-identified application. I have also reviewed the Hämäläinen reference (US Patent No. 5, 647,243, hereinafter "Hämäläinen").

3. Before making the invention described by the above-identified application, the general problem in our fluidized bed gas phase reactor was the fouling of the gas distributor plate. After some time of operation, when a sufficient amount of polymer had accumulated there, the

polymer formed nearly a solid cake which eventually disturbed the operation of the process. We inventors took some time in studying this problem and we found that the problem was the accumulation of polymer on the edge of gas distributor plate (the area touching the wall). Accumulation started from there and finally the agglomerates grew so that they covered substantial fractions of the distributor plate.

4. We inventors then decided to replace the previous gas distributor plate with the presently claimed one which promotes distribution into the fluidized bed of monomers flowing from the lower part of the reactor into the upper part of the reactor, and allows for the gas stream to be fed into the lower part of the reactor along at least 80% of the periphery of the inside of the reactor walls to prevent the formation of stagnant zones in the fluidized bed at the reactor walls in the vicinity of the distribution plate. We found that the problems of fouling the gas distributor plate reduced substantially and now the reactor has been operated for longer periods (of more than one year) without fouling on the gas distributor plate.

5. It is true that Hämäläinen discloses a fluidized bed reactor which includes "flow control elements formed by plate-like surfaces perforated with a number of holes and located so that a major part of the gas flow is directed sideways below the means and a minor part of the gas flow is directed upwards to pass through the holes in the flow means" (from col. 2, line 65 to col. 3, line 3). However, the "flow control element" of Hämäläinen cannot be seen to be the same as the "distribution plate" of the presently claimed invention for the following reasons.

6. First, Hämäläinen aims to solve the problem of the adherence of polymer particles to the wall surfaces of the reactor bottom section (col. 1, lines 64 to 65). The polymer particles are those that were carried away from the reactor by the circulation gas (col. 1, line 65 to col. 2, line 2).

7. Second, the "flow control elements" of Hämäläinen are located in the bottom section of the fluidized bed reactor (col. 2, lines 60 to 62; col. 3, lines 4 to 6; Figure 1, reference number 30; col. 6, lines 1 to 3). The distribution plate is also shown in Figure 1, reference number 15

(col. 5, lines 57 to 62). The text in col. 5, line 57 onwards says that "The polymerization space 12 and the mixing space 13 are separated from each other by a gas distribution plate 15...".

8. Third, when Hämäläinen speaks of directing a part of the flow sideways and a part of the flow upwards it is clear that this is done by the "flow control element" 30 (see, for instance, col. 2, line 65 to col. 3, line 3; col.3, lines 4 to 12; col. 4, lines 17 to 29). The flow control element divides the flow within the mixing space 13 (or, the bottom section) of the reactor and directs the flow into the walls of the reactor therein. However, because of the presence of the gas distribution plate 15 there is no or little influence on the flow pattern within the polymerization space 12.

9. The present invention, however, employs a new and unique construction of the gas distribution plate (reference number 15 in Hämäläinen). According to the present invention this gas distribution plate is designed so that there is an annular opening between the reactor wall and the outer edge of the gas distribution plate. This new design allows the gas flow to sweep the reactor walls within the polymerization space 12 (still referring to Figure 1 of Hämäläinen). Thus, the present invention has a completely different objective than that of Hämäläinen. The objective of Hämäläinen was to improve the flow profile in the mixing space 13 by using special elements directing a part of the gas flow sideways and a minor part of the flow upwards. The purpose of the design of Hämäläinen was to prevent polymer agglomeration in the mixing space. In this mixing space there is no fluidized bed present. The amount of polymer in the mixing space is small. The only polymer present there are the particles that have been entrained by the fluidization gas from the bed. The present invention aims to improve the operation of the polymerization space 12 where the fluidized bed is present.

10. It is furthermore clear that the "flow control elements" 30 of Hämäläinen cannot be understood to correspond to the "gas distribution plate" of the present invention. The gas distribution plate of the present invention separates the upper part, in which a reactor bed of

fluidized catalyst particles can be formed, and a lower part, in which monomer gas can be introduced. In contrast, in Hämäläinen the "flow control element" does not separate the polymerization space (where the fluidized bed is present) from the mixing space (where the gas is introduced). It is clear from Hämäläinen that it is the gas distribution plate 15 which separates the polymerization space from the mixing space. Significantly, there can be no fluidized bed immediately above the "flow control element" 30 because the gas distribution plate 15 blocks the passage of polymer (col. 5, lines 60 to 62). Please note also that the present application refers to Hämäläinen in paragraph [0043].

11. Moreover, even though our pilot plant reactor had been equipped with flow control elements in the mixing space 13 similar to those disclosed by Hämäläinen, it was not sufficient to prevent the polymer from accumulating on the flow distributor plate within the polymerization space 12. This problem was overcome only after the installation of the present invention.

12. Finally, as discussed above, even though in Hämäläinen the "flow control element" directs the gas to the reactor wall in the mixing space 13, the gas flow at the wall moving upwards then hits the distribution plate 15. A gas distribution plate of this prior art design would then prevent the gas from sweeping along the wall of the polymerization space 12 because it would have been solid at the wall and thus no gas flow could pass through. Depending on the design, there could have been a gas flow near the wall but it would not have swept the wall and, significantly, it could not have kept clean the edge where the gas distribution plate was connected to the wall.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2.11-09
Date

Timo Heino
Timo Heino